Low Memory Data Structures

VxWorks/PowerPC applicability

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Many global data structures exist in current IRM/local station nodes that are located in low memory at the same addresses across nodes. With the move to supporting the system code via VxWorks on a PowerPC, we can not retain the same addresses, because VxWorks prescribes how low memory is to be used. Certain diagnostic tools will therefore fail when accessing the new nodes.

As a step toward preserving the appearance of memory being used as it is in other nodes, a memory request for memory data, specified via an ADDR ident of 32 bits, can be mapped into a separate area of memory that we can use under VxWorks. The mapping will simply be an offset that is applied to memory data requests when the target address is in a certain low memory range, say, from `00000400–00007FFF`. In a 680x0 system, the first `$400` bytes are used for exception vectors. All low memory global data structures are located below address `$8000`. In VxWorks, such low memory addresses are of little interest, as they are not available for a user. (In any case, a Telnet session under VxWorks may permit inspection of any area of memory without address translation.) Therefore, any memory data request for addresses in this range, made via Classic protocol, would have an automatic translation applied to an area of memory suitable for housing the same global data structures.

As an example, it is common to use a page application called the Memory Dump Page to inspect areas of memory in any node. Classic protocol is used for these requests. the target node, if it were the VxWorks version, would add a suitable offset to the submitted 32-bit address, so that the data returned would match that used in 680x0 versions. (Obviously, the PowerPC version of the code must be different from the 680x0 version, as they are entirely different CPU families!)

One may access the global variables to find the display text and the cursor position used for the currently-running page application. The 16-row by 32-column page display text is located in each node at `00000400–000007FF`. The column and row numbers are the 16-bit words at `00000F74` and `00000F76`, respectively. The "Page G" page application that is used to remotely operate a page application running in a target node finds the cursor location using these addresses. As the client node moves the cursor, it is written to these target addresses, so that its effects are felt by the target node. Of course, this might have been hidden from an outside system, but this is a historical artifact that exists not only in the page application, but the same logic is used by the same implementations on several other different platforms, such as the Vax, PC, Macintosh, and Unix.

Data structures useful in this context

Address	*Size*	*Meaning*
400	400	Page display text, cursor row, column.
700	80	Task table
788	8	Current time in BCD
790	4	Ptr to interrupt LEDs
794	4	Ptr to Task LEDs
798	1	Decrementing 2000 Hz byte counter

79C	4	System version date in BCD form yyyymmdd
7A0	40	Motor table
C00	80	Digital control table
D00	100	Working system table directory
E00	48	Bus error diagnostics table
E80	140	System global variables
F08	4	Cycle counter
F10	2	Local node#
F12	1	CPU type (20, 40)
F13	1	CPU board#
F18	2	Acnet node# (096F, etc)
F35	1	Length of operating cycle (in 0.5 ms units)
F54	4	Size of maximum contiguous free memory
F58	4	Ptr to first active request block
F66	1	Option switches reading
F78	1	Units lites setting
F79	1	Modes lites setting
F7A	1	Units lites mask
F7B	1	Modes lites mask
F7C	2	Cursor column# 0–31
F7E	2	Cursor row# 0–15
11C0	240	SRM status table
2800	100	Foreign protocol table
2F80	40	Clock event bit map table
2FC0	20	A/D scan diagnostics IP slot c
2FE0	20	A/D scan diagnostics IP slot d
3000	800	Clock event times
3800	800	Settings log datastream*
4800	400	RDATA processing times
4C00	400	Ethernet diagnostic times (n.u.)
5000	400	Network broadcast diagnostics (n.u.)
5800	800	TFTP log datastream*
6000	400	Ethernet receive unit diagnostics (n.u.)
6400	400	Ethernet receive timing diagnostics (n.u.)
6800	800	Foreign node capture diagnostics (n.u.)
7000	1000	Task timing log datastream*

Many of the network diagnostics may not work, because we aren't privy to such low level activities and cannot therefore obtain the needed information.

The starred memory areas in the above range are traditionally used for data stream queues, such as the settings, the TFTP log, and the task timing log.